# 國 立 臺 北 科 技 大 學

## 100 學年度研究所碩士在職專班入學考試

### 電資碩士專班
### 乙組：訊號與系統試題

填准考證號碼

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**注意事項：**

1. 本試題共【6】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。

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1. (12%) A system is defined by the input-output relationship

$$y(t) = x(t^2)$$

Is this system:
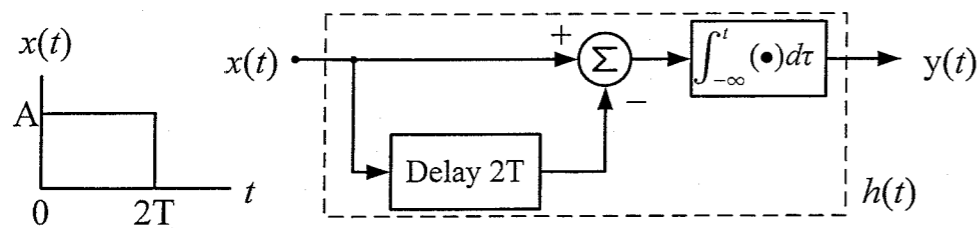(1) Linear? (6%)
(2) Time invariant? (6%)
Justify your answers.

2. (20%) Determine both the normalized energy and power for the following signals.
(1) $x_1(t) = 10e^{(-5+j3\pi)t}u(t)$ (10%)
(2) $x_2(t) = 6e^{j10\pi t}u(t)$ (10%)

3. (26%) An input signal $x(t)$ is applied to the linear system shown in the following Figure.



(1) Determine the Fourier transform of the signal $x(t)$. (6%)
(2) Determine the impulse response $h(t)$ and its Fourier transform of the system. (10%)
(3) Determine the output and its Fourier transform of the system. (10%)

4. (12%) Determine the Fourier transform of the signals shown in the following Figures.
(1) (6%)　　　　　　　　(2) (6%)
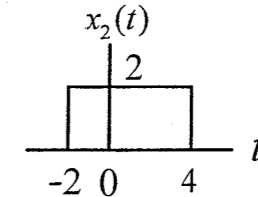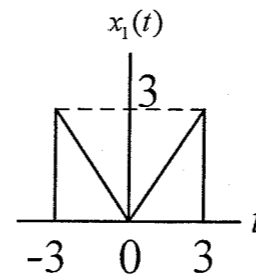


5. (18%) The signal with Laplace transform given below:

$$X(s) = \frac{s+3}{s^2+2s}$$

(1) Determine the initial and final values of the signal. (12%)
(2) Determine the inverse Laplace transform of the signal. (6%)

6. (12%) Determine the Laplace transforms of the following signals:

(1) $x_1(t) = (3e^{-2t} - 2e^{-5t})u(t)$ (6%)

(2) $x_2(t) = \Lambda(t-1)$, (6%)

where $\Lambda(\bullet)$ is the unit-area triangular function.

**NOTE: Express your answer, if necessary, in terms of *sinc* function defined by**

$$\text{sinc}(x) \triangleq \frac{\sin(\pi x)}{\pi x}.$$